

**A WATCHED POT**—Liquid hydrogen aboard the A/S 203 S-IVB stage is monitored in Mission Control-Houston on a television monitor. Orbital behavior of liquid hydrogen was a primary objective of the second flight of the Uprated Saturn I launch vehicle.

## A/S 203 Flight Boosts S-IVB Restart Reliance

After two holds in the countdown—one for S-IVB television camera problems and one because of ground equipment problems at Bermuda — Apollo/Saturn 203 lifted off Launch Complex 37 at 9:53:19 am CST for three orbits of extensive experiments on the behavior of liquid hydrogen in weightless flight.

Television cameras mounted in the upper dome of the S-IVB liquid hydrogen tank relayed a sharp real-time picture of the hydrogen as the level dropped during the S-IVB's powered flight and as the S-IVB became weightless after insertion into orbit.

During the three revolutions in which the liquid hydrogen behavior was observed at ground stations, a simulated engine chill-down for restart of the S-IVB's J-2 engine was run with nominal results.

Gordon Platt, MSFC Propulsion and Engineering Laboratory, described A/S 203 results for newsmen at a post-mission press conference. "During the boost phase," said Platt, "we saw quite a bit of turbulence of the liquid surface. It sloshed around quite a bit, although not really badly. After the J-2 engine cut off, the liquid surface was very quiet and calm, a blob of liquid came shooting up from the surface and came up toward the top of the tank. From Bermuda there was little bit of fog in the tank but that was expected. The observer at Carnarvon had a little trouble seeing it, but once he did, everything looked very calm and the liquid was settled in the bottom of the tank.

"Coming back over the US at the end of the first pass, we saw this first recirculation chill-down which is to chill the engines . . .

The temperatures at the main propellant pumps came down normally as we had hoped that they would, and it seems it performed very well.

"On the third pass," continued Platt, "we planned to vent down the hydrogen tank very rapidly. The tank was blown down very rapidly through the non-propulsive vent system. We saw that the liquid came forward—it was unseated from the bottom of the tank, but I don't think however, that any came out of the vent system."

In summarizing his views of the mission, Platt said, "It looked better than I really expected. I thought that we would

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### TELEVISED EXPERIMENT—

## A/S 203 Mission Examines Liquid Hydrogen in Zero-G

Tuesday's launch of the Apollo/Saturn 203 mission—second in the uprated Saturn I development mission series—is a unique engineering study of liquid hydrogen fuel behavior during orbital flight. A major objective of A/S 203 is to observe operation of the S-IVB stage prior to its use as the third stage of the Saturn V launch vehicle.

### Heaviest US Satellite

A/S 203 did not carry an Apollo spacecraft; instead, the S-IVB stage, the instrument unit and a nose cone orbited as one large 92-foot long, 58,500-pound satellite—the heaviest ever to be orbited by the US. Orbital period was about 88 minutes and the orbit inclined to the Equator 31.98 degrees.

Combined height on Launch

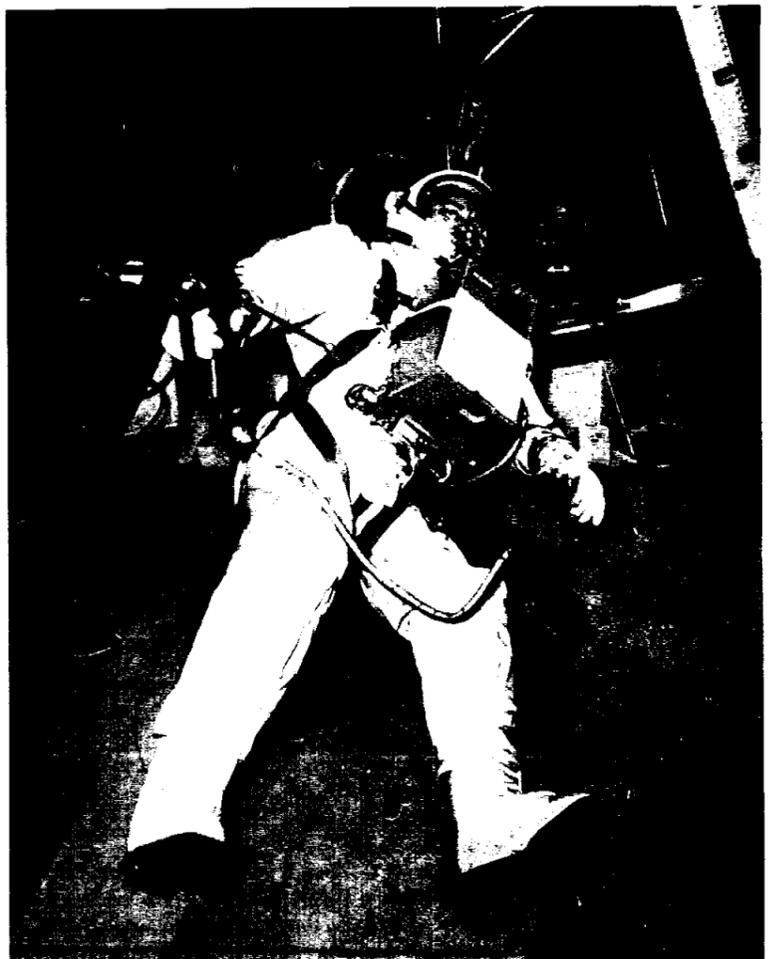
## Berry Receives Chest Society's Top Medal

The American College of Chest Physician's medal for outstanding contribution in diseases of the chest was awarded here recently to Dr. Charles A. Berry, MSC Director of Medical Research and Operations, and to Astronauts Frank Borman and James Lovell.

The presentation was made at the 23rd annual convention of the group held at the Sheraton-Chicago Hotel.

Dr. Berry and Lovell also participated in a panel discussion on Cardiopulmonary Aspects of Space Travel during one of the sessions.

The American College of Chest Physicians is an international society with more than 8,000 members in 91 countries.



**EVA REHEARSAL**—Gemini X prime pilot Michael Collins practices egress from a Gemini mockup aboard a KC-135 aircraft flying weightless parabolas at Wright-Patterson AFB, Ohio. Brief weightless periods up to 30 seconds duration can be simulated in such flights. Collins holds a hand-held maneuvering unit similar to the one he will use in Gemini X EVA.

## Gemini X Cape Preparations Keeping To Launch Schedule

Pre-launch preparations for the Gemini X mission, scheduled for no earlier than July 18, were proceeding on schedule at Roundup press time. Gemini X was hard-mated to the launch vehicle Tuesday and the Gemini X Agena rendezvous vehicle last Friday was mated to the Atlas Standard Launch Vehicle.

Spacecraft XI and its target docking adapter was to be delivered to Kennedy Space Center Wednesday from McDonnell Aircraft Corporation,

St. Louis. By the end of next week, it is anticipated that all Gemini XI hardware will be at the Cape.

Prime and backup crews for the Gemini X mission last Saturday "met the press" in the MSC News Center.

"We plan extensive use of the Agena X's propulsion system to close on the VIII Agena for the passive rendezvous," said prime command pilot John Young. "We will conduct in-orbit tests of several new spacecraft sys-

tems including the super Orbit Attitude and Maneuvering System with over 900 pounds of propellant. And we have replumbed fuel cells, and a cryogenic oxygen system which furnishes both the fuel cell and the breathing oxygen from the same tank," Young continued. "We will be evaluating improved and additional math flows provided by the auxiliary tape memory.

"We have an improved inertial guidance ascent program and an onboard navigation program. With the latter, we intend to investigate the feasibility of calculating maneuvers aboard the spacecraft . . . We have taken pains to develop the mission plan with flexibility in mind for both pre-flight and real-time planning. Due to the untiring efforts of many people, the crew training for the total mission has been excellent, and no part of the mission has been neglected training-wise."

Prime pilot Michael Collins described the Gemini X extravehicular activity. "There are two periods of EVA; the first one is simply opening the hatch and standing up for approximately one hour . . . The main purpose of this EVA is to conduct experiments S-13 and MSC-8. S-13 is an experiment which involves taking the ultraviolet signatures of various star fields. MSC-8 is an experiment involving the color fidelity in our photolab's ability to reproduce those colors which we truly see in space. By taking pictures of a color plate before flight, during

these techniques is through orbital experiments. Overall launch vehicle development will profit from the findings of the A/S 203 experiment as well as the Apollo launch vehicle series.

### Special Equipment

Modifications to the A/S 203 S-IVB stage in support of the liquid hydrogen experiment include:

- Installation of the S-IVB propellant tank repressurization system to be used in Saturn V missions prior to engine restart.

- A hydrogen tank propulsive vent system which provides a continuous, low-energy thrust during orbital coast by exhausting hydrogen boil-off gas through two small nozzles.

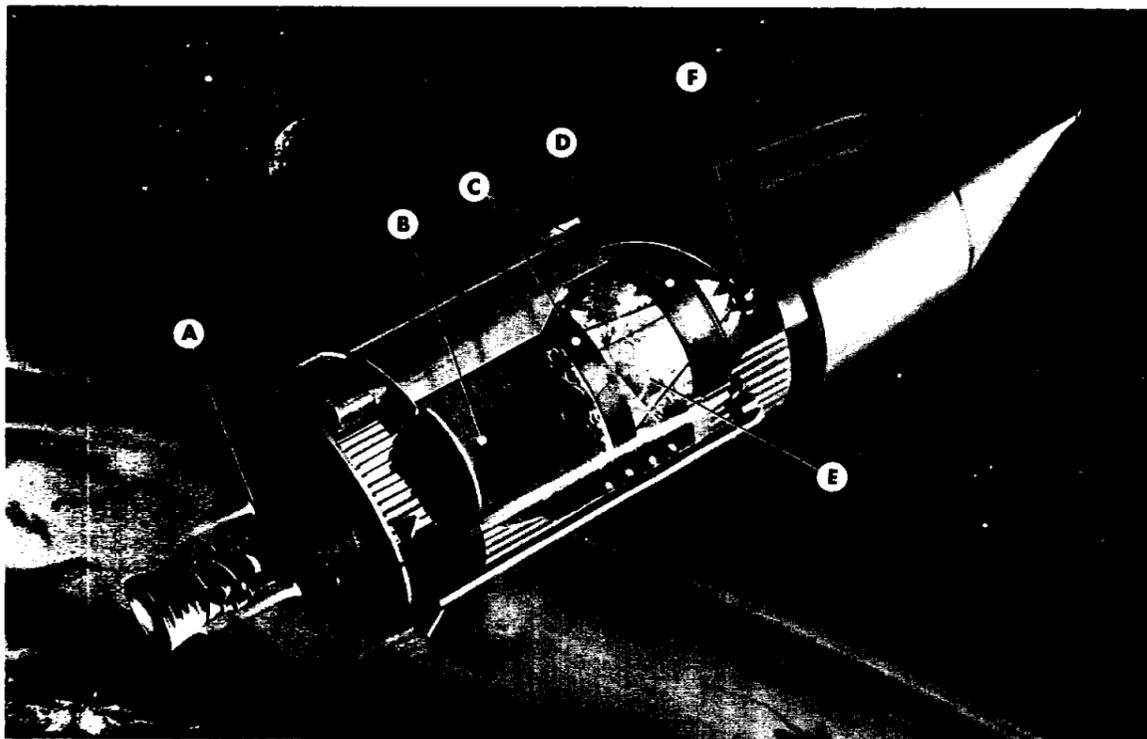
- A separate oxygen tank

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## A/S 203 Liquid Hydrogen Experiment

(Continued from page 1)



**REMOTE LABORATORY**—Cutaway shows how the S-IVB stage of the A/S 203 vehicle will answer questions on how liquid hydrogen behaves in weightless flight. Modifications and equipment for the experiment are: A-gaseous oxygen propulsive vent which provides low thrust at critical moment of change from powered flight to weightlessness; B-liquid hydrogen in the tank, showing expected wave action and sloshing; C-nylon fabric sash baffle and wave deflector in side tank; D-hydrogen continuous vent which will exhaust hydrogen boil-off gas as a source of low-thrust propulsive force to help keep fuel settled during weightlessness; E-gaseous hydrogen filling upper section of the tank; and F-television cameras and lights at top of tank for transmitting live pictures of hydrogen's behavior during four revolutions of experiments.

vent system that will exhaust accumulated gaseous oxygen and which will be a source of low-thrust propulsive force that can be applied in short bursts, thereby simulating Saturn V ullage rockets.

- A nylon fabric sash baffle and a wave deflector installed inside the fuel tank to break up wave action and turn back liquid that crawls up the tank wall.

- Two television cameras and associated lights, assembled as a

unit by Marshall Space Flight Center, and mounted to look through  $\frac{3}{4}$ -inch thick quartz windows in the forward end of the fuel tank.

- Special instrumentation that will measure and telemeter to ground stations the wave action in the tank, temperatures, pressures and density of the liquid hydrogen and hydrogen boil-off gas and any traces of liquid which splash out through the hydrogen vent.

## Findings Announced In Gemini VIII Experiments

NASA has issued a report detailing results of experiments carried on the Gemini VIII mission. The mission ended last March 16 after 10 hours and 42 minutes of its scheduled three-day flight.

Although the duration of the mission was shorter than scheduled, objectives of some of the experiments were partially achieved.

The mission was terminated after the Gemini VIII spacecraft successfully completed a rendezvous and docking with an Agena target vehicle. An electrical short circuit in the spacecraft caused continuous firing of a roll thruster and the spacecraft crew used the reentry control system to regain control. The crew made an accurate guided reentry and landed in the Pacific Ocean 500 miles east of Okinawa.

Data were received in three of the 10 experiments carried on Gemini VIII and a fourth experiment is still on the Gemini VIII Agena target vehicle. The Agena experiment is scheduled to be recovered on a later Gemini flight.

The three experiments which provided data include:

**Bioassays of Body Fluids**—Two post-flight blood samples were received from each flight crew member. An inflight urine sample was collected from the command pilot and samples were taken from the crewmen after the flight. These samples will be useful in establishing a data point as part of a continuing program to assay the flight crew's response to space flight.

**Frog Egg Growth**—Frog eggs are known to orient themselves with respect to gravity during early development. The Gemini 8 data indicates that, when this force of gravity is reduced to near zero, fertilized frog eggs divide normally.

**Nuclear Emulsion Experiment**—Telemetry indicated that the experiment was working satisfactorily and has completed about 17 per cent of its "steps" when the flight was terminated. Because the flight ended before the extravehicular activity, the experiment was not recovered from the spacecraft retrograde adapter section.

**Real-Time Television**  
The television cameras were turned on by ground command and their signals received through S-Band TV links at Kennedy Space Center, Bermuda, Carnarvon, Australia, and Corpus Christi, Texas stations. TV inputs from KSC and Texas were retransmitted to Mission Control Center-Houston and to the MSFC Operations Support Center, while the Carnarvon and Bermuda stations recorded the signals for post-mission study.

Other A/S 203 experiments included a simulated restart of the S-IVB engine, including tank repressurization, engine chill-down and the pumping of liquid hydrogen into the thrust chamber. Actual restart was not possible because the supply of liquid oxygen and pressurizing gas remaining in the stage was insufficient.

**Top of the Stack**  
In addition to propellant studies, an MSC experiment investigating the storage of cryogenic fluids was carried in A/S 203's nose cone. The system consists of an instrumented double-walled spherical cryogenic storage vessel in which subcritical liquid nitrogen, having properties similar to liquid oxygen, provided fuel cell design data for future manned spacecraft.

The industrial team manufacturing the various portions of the A/S 203 vehicle are Chrysler Corporation, S-IB booster stage; Rocketdyne, eight H-1 RP-1/liquid oxygen engines totaling 1.6 million pounds thrust for the S-IB, and a liquid hydrogen/liquid oxygen J-2 engine developing 205,000 pounds thrust for the S-IVB stage; Douglas Aircraft Company, Inc., S-IVB stage; IBM, instrument unit, and NASA-MSFC, the nose cone.

## Control Center Teams Named For Gemini X

Mission Control Center and tracking station flight controller assignments for the Gemini X mission have been made by the Flight Control Division. Gemini X is scheduled for launch July 18.

Although three teams of flight controllers will man the Mission Operations Control Room (MOCR) on the third floor of the Mission Control Center, there will be two flight directors—Glynn S. Lunney and Clifford E. Charlesworth.

Other MOCR positions, listed as 1-first shift, 2-second shift, and 3-third shift, are as follows:

Assistant flight director: 1-Jones W. Roach; 2-Charles S. Harlan; 3-Donald R. Butler. Operations and procedures: 1-Robert G. Britton; 2-Larry W. Keyser; 3-Donald E. Holkan.

Flight surgeon: 1-Dr. A. D. Catterson; 2-Dr. G. Fred Kelly. Spacecraft communicator: 1-L. Gordon Cooper; 2-Edwin E. Aldrin. Booster systems engineer (launch phase only): Donald R. Butler. Tank monitor (launch phase only): M. Scott Carpenter.

Guidance, navigation and control engineer (GNC): 1-Gary E.

Coen; 2-Gerald D. Griffin and Briggs N. Willoughby; 3-Arnold D. Aldrich. Electrical, environmental and communications engineer (EECOM): 1-John W. Aaron and William C. Burton; 2-Richard D. Glover and John A. Delmont; 3-Lloyd V. Howard and Thomas R. Loe.

Agena: 1-Melvin F. Brooks; 2-Bruce H. Walton; 3-James E. Saultz. Agena systems: Harold A. Loden; Bernard R. Brabant; Robert L. Carlton.

Flight dynamics officer: 1-Jerry C. Bostick; 2-Stewart L. Davis; 3-Edward L. Pavelka. Retrofire officer: 1-Thomas F. Carter; 2-William P. Gravett; 3-David V. Massaro. Guidance officer: 1-William E. Fenner; 2-Kenneth W. Russell; 3-Stephen G. Bales.

Support control coordinator: 1-Ledrieu L. Linson; 2-Philip N. Barnes. Network controller: 1-Ernest L. Randall and Richard Ayers; 2-George D. Ojalehto and Lloyd H. White. Maintenance and operations supervisor (M&O): 1-Jimmy C. White and John W. Collins; 2-Robert Pittman and Douglas R. Wilson; 3-Clifton W. Philips and George Metcalf. Public affairs officer: 1-Paul Haney; 2-John E. Riley; 3-Terry White.

Flight controller assignments at stations in the Manned Space Flight Network are as follows:

Canary Islands: William G. Bastedo, command communicator; Ted A. White, Gemini systems; Robert D. Legler and Eugene G. Langenfield, Agena systems; Cdr. R. W. Matter, MC/USN, aeromed.

Carnarvon, Australia: James R. Fucci, command communicator; John E. Walsh, Gemini systems; Paul D. Nering and Harry Smith, Agena systems; Wing Cdr. Morrison, MC/Royal Australian Air Force, aeromed.

Hawaii: Edward I. Fendell, command communicator; Albert W. Barker, Gemini systems; George P. Contois and David W. Stell, Agena systems; Maj. O. Barrett, MC/USA, aeromed.

Guaymas, Mexico: Harold M. Draughon, command communicator; James F. Moser, Gemini systems; Luis J. Espinoza and James A. Joki, Agena systems; Lt. Cdr. R. A. Millington, MC/USN, aeromed.

USNS *Coastal Sentry*: Gary B. Scott, command communicator; Floyd E. Claunch, Gemini systems; Harold V. Berlin and Jack C. Flatt, Agena systems; Maj. J. P. Young, MC/USAF, aeromed.

USNS *Rose Knot*: William F. Buchholz, command communicator; George W. Conway, Gemini systems; Willard D. Robinson, Agena systems; Cdr. A. W. Stevenson, MC/USN, aeromed.

Kennedy Space Center: Charles A. Link, Gemini systems.

## Germany, US Sign Agreement For Joint Project

A cooperative project to investigate the physics of comets, the interplanetary medium and Earth's magnetosphere will be carried out under an agreement concluded by the *Bundesministerium für wissenschaftliche Forschung* (BMwF—Ministry for Scientific Research) of the Federal Republic of Germany and the National Aeronautics and Space Administration.

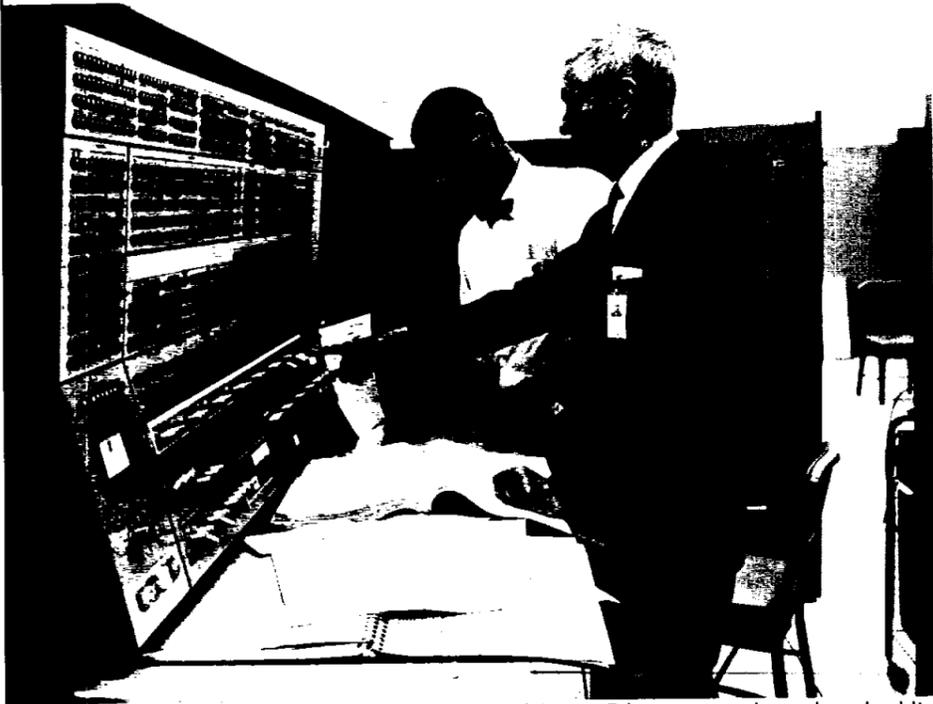
Two sounding rockets, expected to be launched in the fall of 1966, will release vaporized metal in the upper atmosphere to create artificial ion clouds which will be observed from the ground by means of special optical equipment.

Results of the project will be reviewed to determine the desirability of conducting similar experiments on a larger vehicle at a distance of several Earth radii.

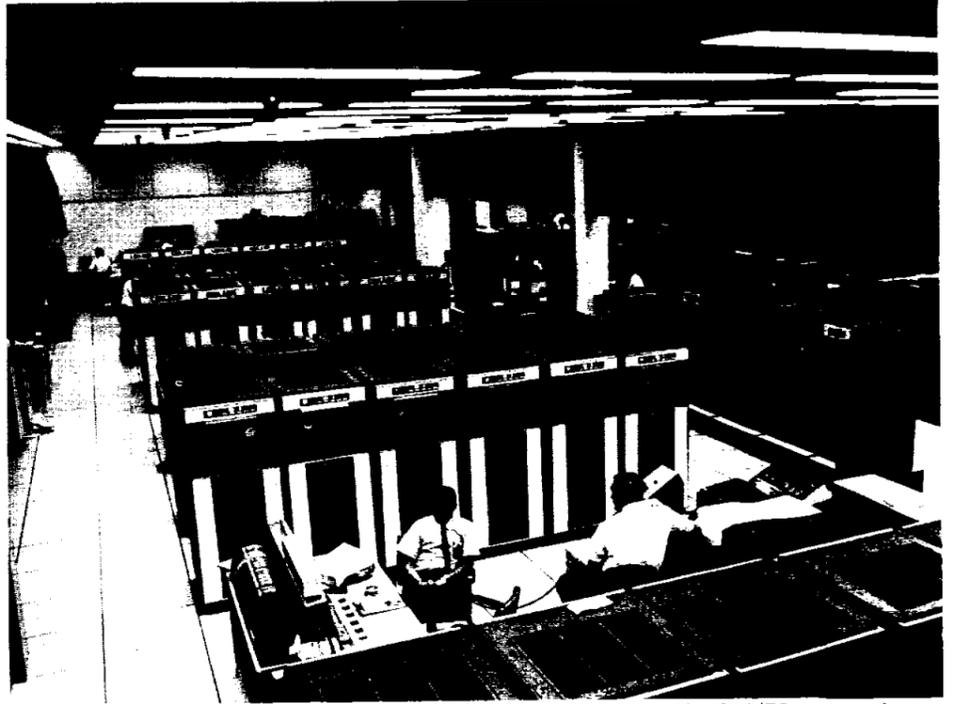
Under the agreement, BMwF will provide the rocket payloads, supplementary cameras and photometric equipment. NASA will furnish one Javelin and one Nike-Tomahawk rocket together with the launching range and support facilities and equipment for optical observations. Each organization will assume the costs of its agreed responsibilities.

The agreement, which extends German-US cooperation in space research for peaceful purposes, is in a memorandum of understanding concluded May 12. The agreement provides that results of the experiments will be made freely available to the world scientific community.

## Real-Time Computer Complex Changeover



**NEW MODELS**—IBM employees Ken Love, left, and James Edgerton run through a checklist on a maintenance console for one of two new IBM 360/75 computers undergoing checkout in the Mission Control Center Real-Time Computer Complex (RTCC). A major problem in the changeover from the IBM 7094s is supporting missions while the equipment is being swapped. The two 360/75s are checking out Apollo real-time mission programs, and three other com-



puters will be installed after completion of the Gemini missions. The 360/75s are replacing IBM 7094s because of their greater memory storage capacity and higher computation speed needed for such Apollo calculations as mid-course corrections. At right, C. T. Jacobsen and R. E. Barton man operating consoles for one unit of the original RTCC 7094 computers.

## Lunar Orbiter Launch Delayed

NASA will not attempt the first launch of the Lunar Orbiter spacecraft during the July 11-16 Earth-Moon opportunity.

NASA had hoped to achieve the launch during the July "window" but has ruled out the possibility so that testing and training periods for the spacecraft and the ground support teams could be extended.

The next launch window is August 9-13. NASA has not determined the feasibility of launching at that time.

Lunar Orbiter is designed to photograph ten sites on the Moon's surface that have been tentatively selected for the Apollo manned lunar landing.

## ORIGINALITY SOUGHT—

## Space Club Names Deadline For Goddard Essay Contest

The National Space Club has announced the opening of the 1966 Robert H. Goddard Historical Essay Award competition.

Open to any US citizen and having a \$200 prize, the competition is named in honor of the world rocket pioneer, Dr. Robert H. Goddard, whose scientific and technological contributions—belatedly recognized in his own country—helped open the door to space.

Essays submitted in the competition may treat any significant aspects of the developmental history of rocketry and astronautics and will be judged upon their originality and scholarship. Entries should be submitted by

November 1, 1966 to the Goddard Historical Essay Contest, c/o National Space Club, 1629 K Street, NW, Washington, D.C. 20006. The winner, to be announced at the Dr. Robert H. Goddard Memorial Dinner in March, 1967, will receive the Goddard Historical Essay Trophy Certificate and a \$200 prize.

The Robert H. Goddard Historical Essay Award was the first literary competition in the field of rocket history. The National Space Club Committee for the History of Rocketry and Astronautics will serve as contest judges. NASA Historian Dr. Eugene M. Emme is committee chairman.

### CONTEST RULES

- Essays should not exceed 5,000 words and should be fully documented.
  - Essays will be judged on originality and scholarship by the Committee for the History of Rocketry and Astronautics of the National Space Club, and their decision will be final.
  - Essays should be received by the Chairman, Committee for the History of Rocketry and Astronautics, by November 1, 1966; the winner, if one is selected, will be announced at the Dr. Robert H. Goddard Memorial Dinner in March 1967.
  - Entries may be submitted by any U. S. citizen, and evidence of citizenship should be included with essays submitted.
  - The name of the competitor shall not appear on the essay, and each essay must have a motto selected by the author in addition to the title. This motto shall appear in three places: a) on the title page of the essay, b) on the outside of a sealed envelope containing identification of the author, and c) above the name and address of the competitor inside the envelope containing this identification. The envelope identifying author will not be opened until the Committee has made the winning selection.
  - Essays and identifying envelopes must be postmarked before November 1, 1966, and mailed in a large sealed envelope marked "Goddard Historical Essay Contest."
  - Essays must be typewritten, legible, double-spaced, on paper approximately 8½ by 11, and must be submitted in duplicate, each copy complete in itself.
  - Essays remain the property of the authors, although the National Space Club retains the right to publish and distribute winning essays.
- Prize: Trophy of the Dr. Robert H. Goddard Historical Essay Award, a \$200 Honorarium, and National Space Club Certificate.

## LONGER USEFUL-WORK PERIODS—

# EVA Has Come a Long Way Since White's 20-Minute Stay

With Ed White's first steps into space from the Gemini IV spacecraft, United States extravehicular activity got its start on an ambitious program of working in a new environment which will lead to man's first step on the moon.

The first EVA outside the vehicle was originally scheduled in the Gemini program to come on the Gemini VI rendezvous mission. A hatch opening and stand up was scheduled for Gemini V. But in the spring of 1965 NASA officials felt that this timetable could be speeded up.

Two important factors which influenced the decision were the early completion of qualification of the Gemini extravehicular suit and the availability of a hand held maneuvering unit for control of the astronaut's movements. The only missing element was a unit for suit ventilation, pressurization and cooling. The Extravehicular Life Support Pack, which was being developed for extravehicular use was just beginning qualification. But the engineers felt that an interim pack could be built out of already qualified equipment. The go-ahead to develop and integrate all the equipment for possible use on Gemini IV was given in late March, 1965, just after the first Gemini flight had demonstrated the capability of the spacecraft.

To exist in the space environment, the two necessary ingredients for survival, air and pressure, must be taken along. In addition, the man must be protected from extreme temperatures and micrometeoroid punctures. In Gemini extravehicular equipment all of these safeguards are integrated.

Breathing oxygen is provided under pressure through the um-

bilical hose from the spacecraft or back pack. Temperature protection comes from a layer of aluminized mylar in the suit, and micrometeoroid protection is another suit layer. The astronaut's eyes are protected from solar glare by a specially tinted overvisor.

A question which was answered during the Gemini IV flight was the possibility of disorientation in free space. Since the astronaut would no longer be confined in his cabin with a constant reference point, there was speculation that he might lose his sense of direction in space.

But Ed White using the three-dimensional spacecraft as reference point, reported there was no disorientation in EVA, either when he used the maneuvering gun or when he operated on the tether during his 20-minute space walk. But White did bring back some suggestions which were incorporated in subsequent EVA.

Tether dynamics were affected by the position of the tether attach point. White kept drifting up and behind the spacecraft. For later Gemini flights the tether was repositioned, and for activity in front of the spacecraft, the tether was secured by a hook and eye arrangement on the nose of the vehicle to prevent drifting back toward the thruster areas on long tethers.

A longer and lighter tether was proposed on later flights to provide flexibility in evaluating the propulsion units. For the Gemini VIII flight, the oxygen line was not carried in the long tether line, and the astronaut now got his oxygen supply from a back pack. Thruster problems terminated the Gemini VIII mission before EVA was scheduled for pilot Dave Scott.

Since the maneuvering unit gave the astronaut positive control of his motions in space, it was decided to increase the capability by carrying more propellant than was available in the Gemini IV unit. For Gemini VIII, the gun propellant was changed from oxygen to freon, since freon has more propelling capability than an equal volume of oxygen. The supply was carried in the back pack instead of on the handle of the gun, as in Gemini IV, and the total increased capability of the unit would have been approximately nine times more than Gemini IV.

The capability to maneuver farther from the spacecraft is provided by the larger chest pack and the back pack together which give more cooling for the crewman and an independent supply of breathing oxygen.

In Gemini IX and XII it was planned to use another maneuvering device developed by the U.S. Air Force, called the astronaut maneuvering unit (AMU). It is a self-contained back pack unit, using hydrogen peroxide for fuel, with control thrusters for attitude and direction control mounted on the corners of the pack. The EVA crewman would wear a woven steel cloth over his legs to protect his suit from thrusters firing in that area. Use of the AMU by Gemini IX pilot Gene Cernan was thwarted by visor fogging during his two hours 10 minutes EVA.

Gemini X pilot Mike Collins will make two excursions from the spacecraft—'stand-up' EVA and tethered EVA using a hand-held maneuvering unit.

The continuing development of extravehicular equipment for man in space will make it possible to live and work for longer periods of time beyond the atmosphere of the earth.

### Receive Chanute Award



PARAGLIDER PILOTS—John Swigert, left, member of the latest astronaut group, shared with Don McCusker, center, the American Institute of Aeronautics and Astronautics' 1965 Octave Chanute Award for "notable contribution made by a pilot to the aerospace sciences." The award was made June 28 for Swigert's and McCusker's part in the Paraglider test program. Swigert made five flights and McCusker made eight. At right is 1958 Chanute Award winner Scott Crossfield. Crossfield and McCusker are North American Aviation test pilots. The AIAA Astronauts Award went to Gemini VIII crewmen Neil Armstrong and David Scott "for outstanding contributions to the advancement of space flight" and for "responding to what may be history's first critical space emergency—a runaway spacecraft—with quick thinking and sound decision." Armstrong shared the 1964 Chanute Award with the late NASA test pilot Joe Walker and Air Force Capt. E.J. Bechtold.

### First Lease on Life



CHARTER HANDOVER—Robert Houlihan, left, Instrument Society of America District VII vice president, June 29 presented ISA Apollo Section president Alfred Eickmeier with the Section's Charter. The Apollo Section of the ISA, with a charter membership of 81, consists mainly of MSC-area aerospace instrumentation scientists and engineers. The Houston Section, of which Houlihan is a member, assisted the Apollo Section in getting organized and chartered. Eickmeier is IESD Assistant Chief for Instrumentation.

FOR THE **BIG THINGS**  
IN YOUR LIFE...

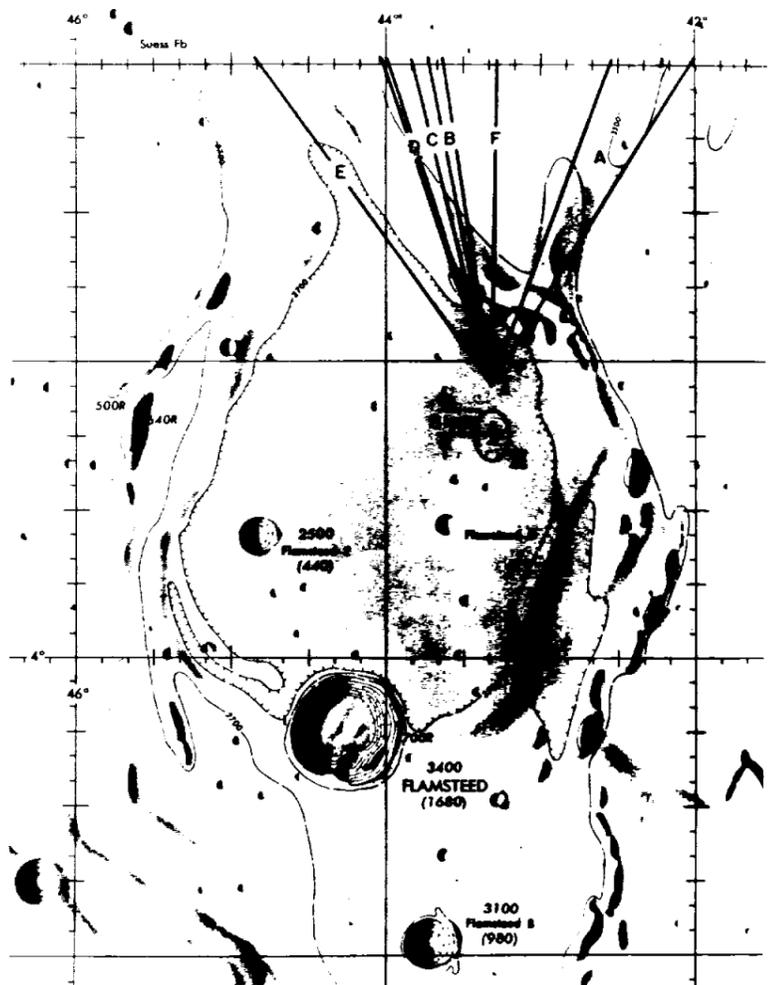


... BE READY WITH  
**U.S. SAVINGS BONDS**

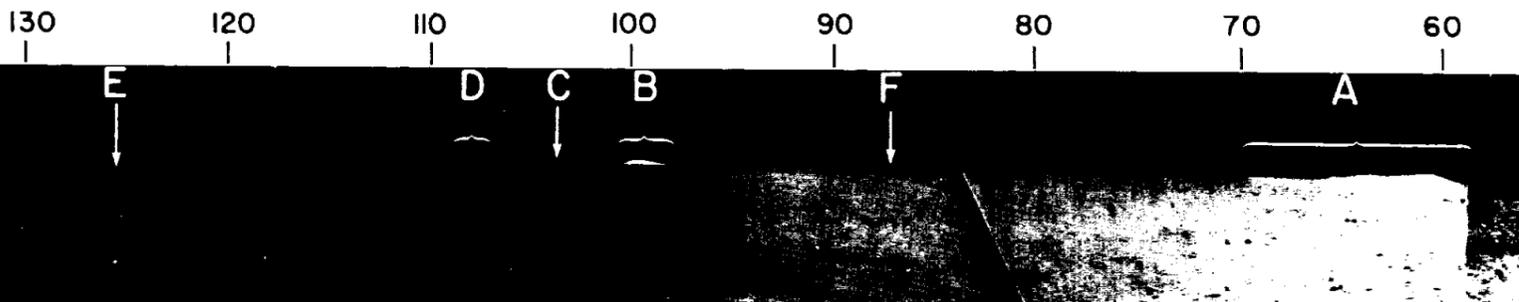
### Surveyor Surveys



LUNAR AFTERNOON—Narrow-angle Surveyor I photos make up this spherical mosaic of the immediate landing area at low sun illumination. The late "afternoon" lighting enhances fine detail of craters and other surface features.



PANORAMA—Surveyor I's television camera sent back the lunar horizon panorama (left) which covers the northern quadrant from 55 to 130 degrees (camera azimuth). The map above shows the probable landing point of Surveyor I as deduced from horizon features. Site II is based upon trajectory tracking data, and the ellipse with a major axis of 10 km is for error allowance.



**Effervescent Exercise**



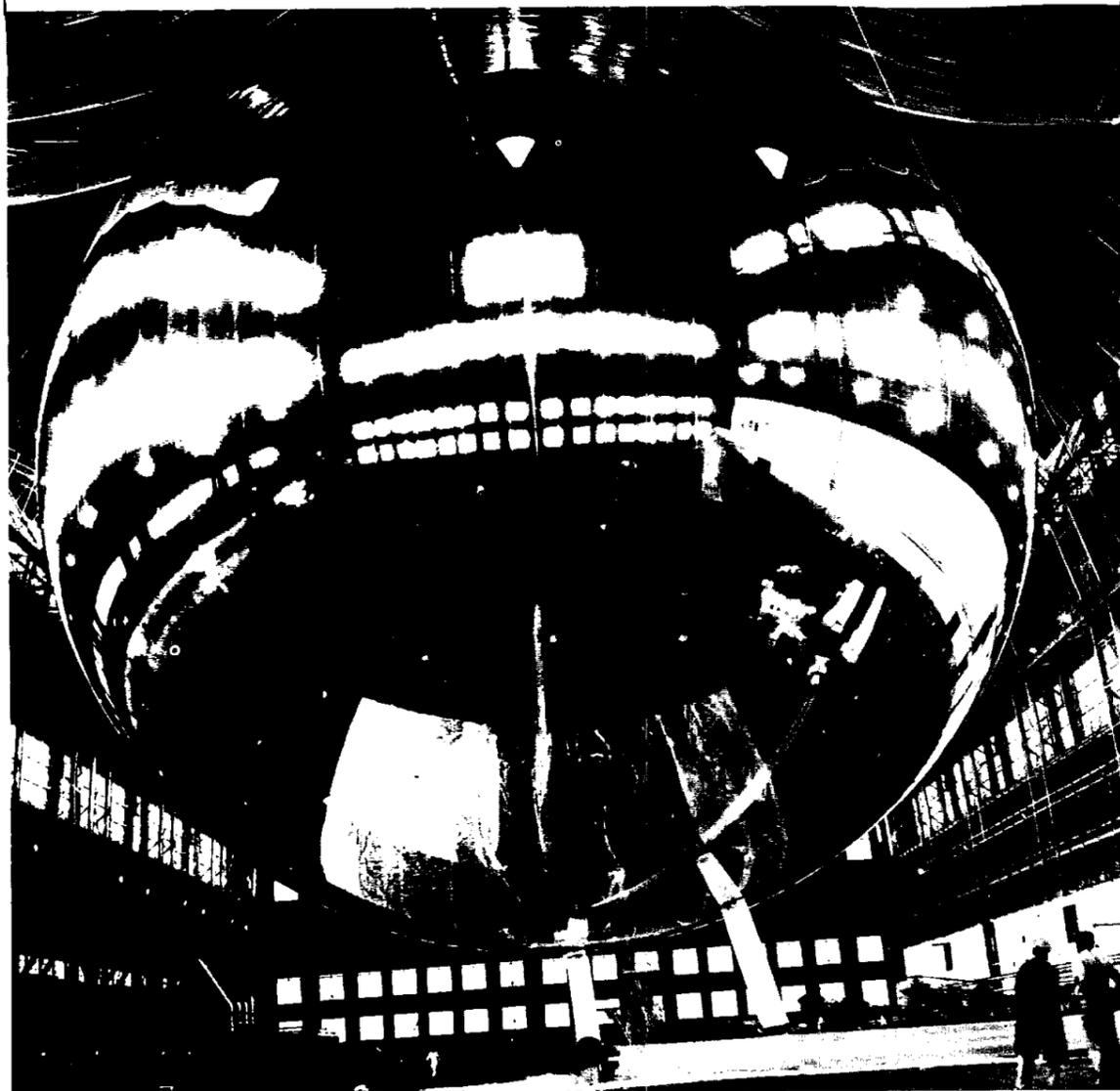
**WHERE THE FIZZ IS**—A bubble column generated by a common drug store indigestion pill aids a Douglas Aircraft Company researcher in gathering data for the design of rocket fuel tank slosh-suppression systems. The effervescent tablets provide visual cues on the behavior of fluids under vibration.

**With Their Eyes on the Stars**



**CELESTIAL CURRICULUM**—The entire group of the 19 astronauts chosen in April and two of the scientist-astronaut group attended a session in celestial navigation recently at the Morehead Planetarium, Chapel Hill, N.C. From left to right and up the stairs are Thomas K. Mattingly, John S. Bull, John L. Swigert, Jr., James B. Irwin, Alfred M. Worden, Fred W. Haise, Jr., Gerald P. Carr, Jack R. Lousma, Vance D. Brand, Paul J. Weitz, Joe H. Engle, William R. Pogue, Bruce McCandless II, F. Curtis Michel, Edward G. Givens, Jr., Charles M. Duke, Stuart A. Roosa, Joseph P. Kerwin, Edgar D. Mitchell, Ronald E. Evans, and Don L. Lind. Kerwin and Michel are from the scientist-astronaut group.

**PAGEOS Pressurized**



**REFERENCE POINT**—PAGEOS (PASSive GEOdetic Satellite), a 100-ft diameter spherical inflatable satellite, will be launched into a 2,600-mile circular polar orbit by a thrust-augmented Thor-Agena D from the Western Test Range. Reflecting sunlight PAGEOS will serve as a reference point for a network of 41 ground stations which will photograph the satellite against a star background simultaneously with cameras 2,500 to 2,800 miles apart, thereby providing a reference point for determining camera positions within an accuracy of 32 feet. PAGEOS' expected five-year lifetime will provide opportunities for photo-geodetic measurements.

**Softball Standings**

MSC/EAFB Fast Pitch League  
Standings as of July 1

| American Division | WON | LOST | GBL | PCT   |
|-------------------|-----|------|-----|-------|
| Philco/WDL        | 5   | 0    | —   | 1.000 |
| 747th. Rams       | 4   | 1    | 1   | .800  |
| Link              | 3   | 1    | 1½  | .750  |
| IESD/LEC          | 5   | 2    | 1   | .714  |
| IBM/RTCC          | 4   | 2    | 1½  | .667  |
| MSC/AF-Mols       | 2   | 4    | 3½  | .333  |
| Lonestars-ASTD    | 1   | 4    | 4   | .200  |
| Graham            | 1   | 4    | 4   | .200  |
| FCD               | 1   | 4    | 4   | .200  |
| TRW               | 0   | 4    | 4½  | .000  |

| National Division        | WON | LOST | GBL | PCT   |
|--------------------------|-----|------|-----|-------|
| NAA                      | 5   | 0    | —   | 1.000 |
| 2578th.                  | 4   | 1    | 1   | .800  |
| Brown & Root             | 3   | 1    | 1½  | .750  |
| IESD                     | 3   | 2    | 2   | .600  |
| CG/Houston               | 3   | 2    | 2   | .600  |
| MSC/Pyros                | 4   | 3    | 2   | .571  |
| Weather                  | 2   | 4    | 3½  | .333  |
| Lockheed Electronics     | 1   | 3    | 3½  | .250  |
| McDonnell Aircraft       | 1   | 5    | 4½  | .167  |
| Hustlers (Comp. & Anal.) | 0   | 5    | 5   | .000  |

MSC/EAFB Slow Pitch League  
Standings as of July 1

| American Division | WON | LOST | GBL | PCT   |
|-------------------|-----|------|-----|-------|
| FCSO              | 7   | 0    | —   | 1.000 |
| TSD-All Stars     | 6   | 0    | ½   | 1.000 |
| Mets-Security     | 6   | 0    | ½   | 1.000 |
| Misfits-IESD      | 4   | 1    | 2   | .800  |
| Animals-MPAD      | 4   | 2    | 2½  | .667  |
| Philco/TR         | 4   | 3    | 3   | .571  |
| Batmen-FSD        | 3   | 4    | 4   | .429  |
| Pro & Con         | 2   | 4    | 4½  | .333  |
| Trw-Ogos          | 2   | 5    | 5   | .286  |
| Lunartics-ASPO    | 1   | 6    | 6   | .143  |
| LRD               | 0   | 7    | 7   | .000  |
| MPAD-FAB          | 0   | 7    | 7   | .000  |

| National Division  | WON | LOST | GBL | PCT  |
|--------------------|-----|------|-----|------|
| Hustlers-P&PD      | 6   | 1    | —   | .857 |
| CG/EAFB            | 5   | 1    | ½   | .833 |
| UNIVAC             | 4   | 1    | 1   | .800 |
| MPAD-RAB           | 4   | 1    | 1   | .800 |
| SSD                | 4   | 2    | 1½  | .667 |
| Moonrakers-SMD     | 4   | 3    | 2   | .571 |
| CSD                | 3   | 3    | 2½  | .500 |
| RMD-Plus           | 2   | 4    | 3½  | .333 |
| Lockheed-Operators | 2   | 4    | 3½  | .333 |
| IBM                | 1   | 5    | 4½  | .167 |
| Dirty Sox-FSD      | 0   | 5    | 5   | .000 |
| Virginians-TSD     | 0   | 5    | 5   | .000 |

## OUT OF TEXAS' PAST—

# Handgun Justice Stayed Around Long After Law Came to Texas

Clear Lakers who may feel concerned about the local homicide rate may take some slight reassurance from the historic fact that the high incidence is not a recent trend. It antedates orange-and-black fireplugs, beer on the rocks, suburban rodeos and even the 37.85-liter hat.

A few years ago a reporter for a crusading local newspaper that no longer exists asked a hometown criminologist to explain this superstate's undisputed leadership in non-traffic slayings. The interviewee, who was associated with both a local university and the municipal constabulary, replied:

"It's just that the old Texas tradition of wiping out dishonor with blood still survives."

Maybe so. The code duello survived in Louisiana long after dueling became illegal, but it finally vanished. No doubt murder with malice will subside one day in this commonwealth that made the sixshooter famous.

In pioneer days each Texan had to be his own marshal, prosecutor, judge and executioner. There are even sons and daughters of the unistar living today who remember a breed of durable souls that lived and died by the handgun long after nominal law and order had come to the land.

And today it's not always easy to say which were the good guys and which the bad. Often each gunslinger was a bit of both. What we can say is that they often killed without a microsecond's hesitation, as did Lige Briant, sheriff of Sutton County. And that they died, most of them, by the Western code—like Will Carver, who, with his shooting hand smashed by Sheriff Briant's bullet, tried a border switch and died screaming to his fellow nonconformists: "Die game, boys! Die game!"

But Lige did not kill Will because Will was an outlaw. It was because Will had killed George Scarborough. And Will had killed George because George had killed John Selman. But Selman had it coming because, as you may remember, he was the man who had killed John Wesley Hardin.

Less widely known than Hardin was a killer's killer called Wild Bill Longley, who slew his first man on Preston Avenue in Little Old Houston just 100 years ago, in 1866.

Bill was 15. He had come to Houston from his farm home on Mill Creek, Austin County, to get what his biographer called "a third arm."

(The biographer, Ed Bartholomew, once wrote a factual book called *Western Hard Cases*, in which every one of 83 Western gunmen was named Smith.)

Of Longley, Bartholomew writes: "He wanted . . . a surer, shorter arm that would do a certain job. Not just a gun. A gun is and was a shotgun. He wanted a pistol. A pistol is and

was a Colt or a Dance, a .44, a .45, a sixshooter. He wanted to stand up as a man; he had man-sized work to do.

"That night Bill and a new-found companion walked uptown to observe the sights. Polished black boots flashed by, supporting blue-clad flesh and bone: felt hats pulled low, belts hitched tight with pistol flaps out. The lights came on all over town. In the finer homes, where the brass was quartered, some were quietly cursed under breath by merchants and professional men. . . . But in the saloons, where Yankee money rang true on hardwood bars, they were hardly cursed at all.

"Hard female voices echoed in hard tune: 'Where you going, soldier? Where you from?'

"'Me, I'm from downstate New York. Nothing like this hell-hole. Got ferryboats and playhouses up there. No dirty mud like this place.'

"'Well, now, dearie, how about a nice stiff drink of what shrunk the cat's hide?'"

## Death Wears Many Hats

(Part of a continuing series on driving, home and job safety by the MSC Safety Office.)

In less time than it takes to eat a brown-bag sandwich—about ten minutes—two people are killed and 194 are injured by accidents in the United States. Of the 100 citizens who are killed by accident between the time we hike to the parking lot, 44 of these will have died in auto accidents, 26 in home accidents, 17 in accidents away from home or work and 13 from on-the-job accidents.

Statistically, then, each of us is moonlighting on a second job—the job of staying alive.

A man's home is his castle, yet this supposedly safe castle is the setting for 26 percent of all accidental deaths—deaths caused by hazards that sneak across the moat to prey upon all members of the family from toddlers to the breadwinner. Among these causes in the home are slippery floors and stairs, falls from stools and ladders, workshop power tools, defective electrical appliances, poisoning from chemicals kept under the kitchen sink where little fingers can find them, and fires.

Away from the castle, automobile accidents for the past ten years have been creeping toward the 50 percent mark as the cause of accidental death. Despite probable mechanical improvements in automotive safety arising from congressional hearings and from the controversial book, *Unsafe At Any Speed*, the responsibility for reducing auto accidents still rests upon that non-linear actuator attached to the steering wheel. Today's driver must not only think for himself, but he must also try to fathom what the driver ahead of

Bill and his friend in dirty Confederate gray walked down lower Milam Street to Preston Avenue. Near the Long Bridge a big man in a blue uniform squared his feet in the two young Texans' path, swinging a lead ball from a leather thong. "Ain't you learned your lesson? It's against the law to wear gray, boy. Take off them gray clothes! Gimme them shoes!"

A moment later the state policeman died with Bill Longley's Bowie knife in his kidney, and Rattling Bill had his first pistol, a Dance sixshooter, made in West Columbia.

Wild Bill is known to have killed at least 32 men in the next 11 years, and there must have been more. In one of his published letters he called himself "the most successful outlaw that ever lived in Texas."

But they executed some killers in those days. And when they finally hanged Rattling Bill Longley, he died game.

him or on an intersecting street is going to do. Defensive driving coupled with uncommon common sense and basic regard for the other fellow remains the key to sidestepping death on the highway.

Getting off the highway to a favorite vacation spot does not always place a King's X between us and accidental death, for unsupervised swimming, boating and other outdoor activities also take their tribute from the living.

A visitor from outside our galaxy might easily conclude that Americans have an inherent death-wish when he observed the way we kill ourselves needlessly in accidents.

He might just have a point . . .

## Ingenuity Profits Those Who Put It To Work

Free enterprise is the backbone of the American economical system, and according to a recent issue of a duPont publication, a resourceful young man made a practical application of the free enterprise principle.

"It seems the boss was getting married, and a young eager employee had the responsibility for buying the wedding present.

"By diligent effort he collected 30 cents from each of 2,000 employees. With the accumulated \$600 he bought 2,000 packs of cigarettes—the kind with the coupon on the back.

"He used the coupons to obtain a silver tea set which was accepted as a very generous gift. Then, to each of the 2,000 employees he gave a pack of cigarettes in return for their original 30 cents.

The SPACE NEWS ROUNDUP, an official publication of the Manned Spacecraft Center, National Aeronautics and Space Administration, Houston, Texas, is published for MSC personnel by the Public Affairs Office.

Director . . . . . Dr. Robert R. Gilruth  
Public Affairs Officer . . . . . Paul Haney  
Editor . . . . . Terry White  
Staff Photographer . . . . . A. "Pat" Patnesky

## Space News Of Five Years Ago

July 13, 1961—The Redstone launch vehicle designated for the Mercury-Redstone 6 mission was static tested for 30 seconds at the Marshall Space Flight Center to ensure satisfactory operation of the turbopump assembly.

July 18-19, 1961—Two attempts were made to launch

## Visitor Badging Locations Cut To Bldgs. 2, 100

Effective July 5, Visitor Control points are located in Buildings 2 and 100 only. All employees are reminded that visitors to MSC must be badged and escorted while within a NASA occupied building unless they are authorized to have respective building numbers placed on their badges. Procedures for obtaining this authorization are contained in MSC Announcement 66-2, dated January 4, 1966.

Permanently badged employees who have lost or forgotten their badges must go to one of the two locations specified to obtain a temporary badge. Building guards will conduct periodic checks and will direct any person without a badge to one of these points.

Generally, visitors who can readily be identified as such will be sent initially by the gate guards to the visitor registration desk in Building 100. Visitors who enter MSC via NASA transportation or with permanently badged employees should be brought to the visitor control point in Building 2.

Mercury-Redstone 4 with Astronaut Virgil Grissom aboard the spacecraft, but unfavorable weather forced mission postponement.

FAI (*Federation Aeronautique Internationale*) officially recognized the first space flight records claimed by USSR and the United States: Yuri Gagarin (April 12, 1961): Duration in orbital flight, 108 minutes; greatest altitude in earth orbital flight, 203 miles; greatest mass lifted in earth orbital flight, 10,395 pounds. Alan Shepard (May 5, 1961): Altitude without orbit, 115,696 miles; greatest mass lifted without earth orbit, 4,031.7 pounds.

July 20, 1961—NASA and DOD, following an exchange of letters between the Administrator of NASA and the Secretary of Defense, established a joint study to determine the national launch vehicle needs for the next decade, considering the requirements of both NASA and DOD.

July 21, 1961—Mercury-Redstone 4, designated Liberty Bell 7, the second Mercury manned suborbital flight, was launched from Cape Canaveral with Astronaut Virgil I. Grissom as the pilot. From liftoff to reentry, operational sequences were similar to those of the first manned suborbital flight. In the ballistic trajectory, the spacecraft reached a peak altitude of 118 statute miles and landed 303 statute miles downrange from Cape Canaveral. Grissom's flight experience was similar to Shepard's in that there was a 5-minute period of weightlessness, and neither reported any ill effects resulting from this condition. The MR-4 pilot also found it easy to control his spacecraft in attitude in the manual mode of operation. The spacecraft was lost during the recovery operations when the explosive side egress hatch activated prematurely while Grissom was waiting for helicopter pickup. The astronaut egressed immediately and was retrieved after swimming in the water three or four minutes. With this second successful suborbital flight, the Space Task Group felt there was nothing to be gained from this phase of project Mercury, and the remaining Redstone launch vehicle flights were cancelled.

At the request of Senator Paul H. Douglas, the membership of the American Astronomical Society was polled by the University of Illinois Observatory as to their opinion regarding the "scientific value" of the US space program to land on and return one or more men from the moon.

# Space News ROUNDUP!

MANNED SPACECRAFT CENTER, HOUSTON, TEXAS

## EMPLOYEE NEWS

### Credit Union Offers Dinner-for-two Chances

The MSC Federal Credit Union July 15 will begin bi-weekly drawings of depositors' names for dinner-for-two at a local restaurant, and will end the contest with a drawing September 30 for a television set.

To be eligible for a chance in the drawings, a Credit Union member may either bring in a new member (including members of the immediate family) or deposit \$100 to his account. There is no limit to the number of chances a member can have. Credit Union Board of Directors members or committeemen and their immediate families and employees of the Credit Union are not eligible.

The first drawing will be on Friday, July 29 at 2 pm and every alternate Friday thereafter until the final drawing for the TV set on September 30. After each bi-weekly drawing, all names will be placed into the final drawing box.

### FEGLI Benefits Total \$1 Billion During 12 Years

One billion dollars in benefits have been paid under the Federal Employees Group Life Insurance program since it went into effect in August 1954, the Civil Service Commission announced. A total of 188,500 claims were processed in this period of time for death, accidental death, and dismemberment benefits involving Federal employees or retirees.

Almost three-fourths of the benefits paid under this voluntary, contributory program went to widows of the deceased employees or annuitants. The remaining one-fourth was paid to children, widowers, parents, other next of kin, and designated beneficiaries.

In commenting upon the program John W. Macy, Jr., Chairman of the Civil Service Commission, said: "The significance of the program is not only in the amount of money paid out in claims but in the story told in the many letters received from the beneficiaries. There have been such statements as these in the letters: '... This check makes it possible for me to keep our home. ... In short, without your help, the children would not have the opportunity to seek higher education. ... It has meant a good deal in the lives of my three daughters, and in mine. ...'

The Office of Federal Employees Group Life Insurance, which pays these claims for the insurance industry, consistently processes claims within five days after receipt, provided the necessary proofs are submitted with the claim.

Administered for the Government by the Commission's Bureau of Retirement and Insurance, The Federal Employees Group Life Insurance program is the largest civilian employer-sponsored group life insurance plan in the world. About 2,200,000 Federal employees, or 95 percent of the work force, are covered. In addition, 370,000 persons now on the civil service retirement rolls have continued their coverage. The total amount of insurance in force is almost \$19 billion.

### 42 Tournament Starts July 27

MSC employees who enjoy shuffling the speckled tiles are invited to take part in the Lockheed 42 tournament to be held July 27, 28 and 29 at Ellington AFB.

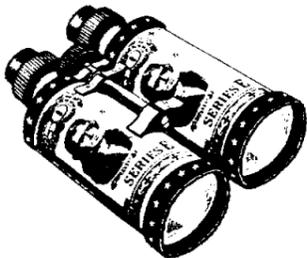
Team entries can be made up of two men, two women or mixed, and there will be an entrance fee of \$2.50 per team. "Texas 42" rules will be followed in the tournament, and trophies will be awarded to winners of each round, runner-up and champion. Special awards will be made to teams that win all games of a round. (Each round will be the best of five, and there will be two rounds each night).

Doug Wright at 5575 is organizing the tournament.

### Fall Bowling League Begins in September

July 31 is the deadline for registering teams in the Lockheed Fall Bowling League. The League is open to MSC employees and their families and will be made up of 24 five-member teams of three men and two women each.

League play is scheduled to begin the first week in September. A business meeting will be held for organizing the League on August 3, 1966. Doug Wright at 5575 has further details.



### Star-spangled way to look ahead

One of the best ways to keep a watchful eye on your own future as well as your country's, is with U.S. Savings Bonds.

### Buy U.S. Savings Bonds

### Flyers Ponder New Constitution

A revised constitution will be distributed and voted upon at the July 12 meeting of the MSC Aero Club, and all Aero Club members have been urged to attend the meeting. The meeting will be at 5 pm in the MSC News Center Auditorium.

Other items of business include distribution of discount rate sheets, a new club brochure, and membership cards for those members joining within the past two months. Two Aero Club members will debate the relative merits of buying a Cessna 150 or Cessna 172 before the membership is asked to vote on the issue.

July 5 was the deadline for Aero Club members to submit their commitment forms pledging a minimum number of flying hours each month.

## Council Seeks Approval For Recreational Area

Prize-winning and honorable designs for an MSC recreational facility from a recent conceptual architectural design competition at Rice University and the University of Houston will be displayed in the MSC Cafeteria from July 11 through 15.

Paul E. Purser, chairman of the MSC Exchange Council, announced that a committee of the Exchange Council and representatives of the Employees' Activities Association will use the designs in preparing a proposal to MSC and NASA management for an on-site recreational facility for use by MSC and on-site contractor employees.

Designs entered in the competition were based upon an analysis of an EAA questionnaire sent out to employees early this year and for which there was a 57 percent response. (See April 29 Roundup.)

Purser emphasized that the architectural concepts are for long-range master planning of the MSC recreational facility construction. The Exchange Council's immediate objective is to obtain approval for a significant portion of the recreational

facility and to fund its construction as soon as practical.

The Exchange Council committee charged with planning the facility is chaired by Philip Hamburger, with members Arthur Garrison and E. W. Boddeker III. Assisting are EAA Members Bill Creasy, Hugh Scott and David Mullins.

### MSC Cafeteria To Raise Prices In Late July

The NASA Exchange-MS C has announced that selective increases must be made in Cafeteria food prices. Paul E. Purser, Chairman of the Exchange Council, stated that the rising cost of food items and other Cafeteria expenses make the increases necessary.

Food costs within the past year have risen in excess of 10 percent. Up until this time, the increased costs have been offset by operational economies in other expenses but this approach is no longer sufficient. As of May 31, 1966, the cumulative losses from Cafeteria operations were nearly \$8,000; and, for the month of May alone, the loss exceeded \$2,000. In the judgment of the Exchange Council, costs of food and other expenses will continue at such a level that continuing losses will be experienced unless Cafeteria prices are raised to offset increased costs.

The management instruction issued by the Director which established the NASA Exchange-MS C contains the general provision that the Exchange "shall sell merchandise at the lowest possible prices consistent with its cost of operation and its other financial needs". Since the Cafeteria was established as a self-sustaining, non-profit enterprise, only two choices of action remain open to eliminate losses — raise prices or reduce quality or service. A price increase was approved by the Exchange Council as more in keeping with employee welfare.

Cafeteria prices will be raised in late July on selected items which are now sold at a loss. Although individual food item prices will be raised as much as 10 to 50 percent, the overall average increase in prices is expected to be in the range of 5 to 10 percent.

### Gate May Be Locked Before You've Gone

The Security Branch has received several inquiries concerning hours of operation for the different gates. The hours of operation are as follows:

| GATE            | HOURS           | DAYS    |
|-----------------|-----------------|---------|
| 2nd Street      | 24              | Sun-Sat |
| Entrance        | 6:30 am-6:00 pm | Mon-Fri |
| 3rd Street Exit | 6:30 am-8:00 pm | Mon-Fri |
| 3rd Street      | 1:00 pm-5:00 pm | Sundays |
| Ave B—East      | 6:30 am-6:30 pm | Mon-Fri |
| Ave B—West      | 6:30 am-6:00 pm | Mon-Fri |

There is no change in the hours of operation during the summer months.

## Roundup Swap-Shop

(Deadline for classified ads is the Friday preceding Roundup publication date. Ads received after the deadline will be run in the next following issue. Send ads in writing to Roundup Editor, AP3. Ads will not be repeated unless requested. Use name and home telephone number.)

### FOR SALE

Lotus 7 spares for many engines. Pair of 1 1/2" SU carbs, Volvo w/ford-Lotus manifolds and linkage \$35. (Healey, TR, etc) Coxworth A-111 billet cam \$40. Stock Anglia 105-E gearbox \$35 complete. Jan Farbman, WA 6-7192 or RI 7-3435.

Self-contained travel trailer, air conditioned, sleeps six, two years old. Low down payment; low monthly terms. Lloyd Arnold, HO 5-1877.

32-foot ChrisCraft cruiser, sleeps 6, new upholstery, rebuilt engines and hull. Stall 36 Lakeside Boat Storage. NASA Road 1. Asking \$4000. Henry Fancher, 877-1379.

15-foot Smithcraft runabout, deep sides-broad beam, sleeps 2, convertible top, like-new 40-hp electric-start motor, tilt trailer, ski equipment, \$850. R. Herold, PA 9-0852.

3-bdr, 2-bath 1-story brick in Swan Lagoon across from MSC, central heat/air, fenced yard, landscaped. \$22,500 or equity plus assume 6% loan and \$142/mo payments. Dr. Howard A. Minners, 2523 Lazy Lake Drive, 932-2417.

Trumpet and saxophone in fair condition, make offer. Dale Nussman, HU 6-0359.

3-bdr 3-bath, large screened area, wooded site, 277-ft Clear Creek frontage, electric boat lift and boat barn, central air/heat, carpets, drapes. Off Deepwood Drive, Friendswood. Bonnie Langston, HU 2-7478 or MO 4-2452.

Skindiving equipment: 71.2 cu ft tank and J-valve, single-hose two-stage Scubair regulator, pressure gauge, contoured back pack, emergency life vest. Never in water—still in original boxes. \$100. Frank Greene, 591-2305.

1961 4-door Buick Special, radio, heater, auto trans, 155-hp V8, needs repairs. \$100. Barker, HU 8-0790.

1960 Ford Galaxie, 65,000 miles, 17 miles/gal, xclnt shape except for rusting on rocker panels, power steering/brakes, auto trans, radio, heater, white-walls, V8; white ext/aqua int. \$300. Jack Garman, League City 932-2140.

Antique dining room suit complete. \$150 or trade. Bill Douglas, HU 7-0446.

Cocker Spaniel pups, blond, black and black/tan. AKC registered, champion sired. Charles J. Olano, Arcadia 925-3210.

1964 Volkswagen sedan. Transferred out of state—must sell. Lois J. White, HU 6-2816.

1960 Pontiac Star Chief 4-door sedan, power brakes/steering, radio, air, good tires and engine. Asking \$595. (Owner bought new Pontiac.) Vance Jones, HU 4-1321.

3-2-2 custom designed, over 2000 sq ft living area incl sunken living room, large paneled family room, built-in elec kitchen, dining area, large utility room, carpeted, central heat/air, AM/FM radio-intercom, patio gas grill, landscaped. \$1075 and assume 6% loan. \$159/mo, Sagemont. Larry Shipley, HU 7-0205.

1964 Valiant V-100, straight shift, heater/defroster, white, 30,000 miles left on warranty. \$1095. J. C. Jones, HU 6-4849.

4x8 Brinkum pool table, 1 yr old. \$225. Forest Sealey, HU 6-3451 after 5.

Zenith stereo record player, 40 watts/channel, dark walnut console w/two each tweeters and woofers, five yrs old, xclnt condition. Original cost \$465; sell for \$125. Rod Bass, Dickinson 534-5465.

4-bdr, 2-bath brick (including 5th upstairs dormer) central air, wall-to-wall carpet, 2-car garage, partially fenced, large den with built-in bookcase, 10x20 rear patio. Sell or rent with or without furniture. Mel Feldman, HU 8-2304.

3-bdr 2-bath brick in El Lago Estates, terrazzo floors, large den w/fireplace, built-in bookcases and desk, paneled, on nearly acre wooded lot. John J. Bertin, 877-3307.

Want to buy or take up payments on good two-horse trailer, David Lindsay, 932-3341.

3-bdr 2-bath in McGregor Palms, large den, living/dining room, central heat/air, carpets, dishwasher, sewing room, \$14,425 FHA. Don Donohoe, MI 5-6751.

3-bdr 2-bath brick, Arlington Heights, large den, fenced back yard, near schools and shopping center. FHA or conventional. Sarah W. Lopez, HU 6-4609.

AKC-registered Beagles, 8-weeks old, champion sired, shots, wormed. H. S. Cobb, 748-5034.

### FOR RENT

3-bdr 2-bath brick in El Lago, fireplace, landscaped, GE built-ins, dishwasher, utility room. Available Sept. 1; prefer year lease. \$185/mo. Don Wagner, 877-4965.

### CAR POOLS

Ride wanted from Parkview Manor-Pasadena to Bldg. 8, 7:30-4 shift daily. D. E. Jackson, HU 4-1316 after 4:30.

## Space News ROUNDUP!

### SECOND FRONT PAGE



**SAFETY FOREMOST**—The U. S. Department of Labor's Allan "Ike" Martin (left), who conducted the recent Supervisory Training Course at MSC, is shown discussing an element of the Mission Safety 70 Program's "traffic funnel concept" with MSC's Safety Officer, John Kanak (right).

## 53 Supervisors Finish Safety Training Course

Fifty-three MSC and contractor supervisory personnel recently completed a course between June 13-24, 1966, in "Supervisory Safety." This training program, conducted by the Labor Department's experienced safety engineer, Allan "Ike" Martin, was specifically designed to assist supervisors at MSC to more effectively carry out the all-important safety functions of their responsibilities. MSC's Safety Officer, John Kanak, arranged for this training program which was conducted under the combined auspices of the Manned Spacecraft Center's Employee Development Branch and the Bureau of Labor Standards, U. S. Department of Labor.

The safety course, enhanced by the use of various audiovisual second such course to be taught at MSC within the past year, and treated the following topics: Supervisory responsibility for safety, Fire Prevention and Protection, Accident Causes, Accident Investigation, Determining injury rates and motor vehicle safety. Aspects of the President's Mission Safety 70 Program were stressed throughout the course program.

MSC and Contractor supervisory personnel who successfully completed the Safety Training Program were:

MSC: Donald Alcorns, Bill Calhoun, Marl Lee Cox, V. B. Fisher, Norman Eubanks, Howard Graves, George Gurganiou, Ramirez Perez, Arthur Richardson, Phillip Stallings, Al Thiel, and C. T. Yacura (Administrative Services); Charles Beers (Flight Control); Cloyd Brooks, Albert Bucknell, Chester Cotton, Emerson Gray, Ed Leatherbury, Roger Messier, Frank Vaughan, James Warren, Clyde Waters, Louis Wilde, and Ralph Workman (Technical Services); George Corley and R. E. Goodwin (Guidance and Control); J. H. Ferrese (Instrumentation and Electronics Systems

Division): E. J. Heppner and J. D. Shannon (Landing and Recovery); Gene Parker and Michael Simmons (Management Services); James Parker (Structures and Mechanics); Al Wells (Information Systems); and Wade Vance (Power and Propulsion—Thermochemical Test).

Contractor: John Fodor, Mel Hettervig, and Bill Stanley (IBM); Charles Brown, H. E. Clauder, A. P. Kubaneck, and D. C. Swann, and W. R. Woods (North American Aviation); Albert Burns, Ronald Gleen, A. J. Lohr, and Joseph Saltalamacchia (IT & T); C. O. Cummings; Robert Ellis, R. W. Randall, and Hubert Stewart (Brown & Root-Northrop); James Snell (Philco); and Sal Esparza (Associated Transfer and Storage).

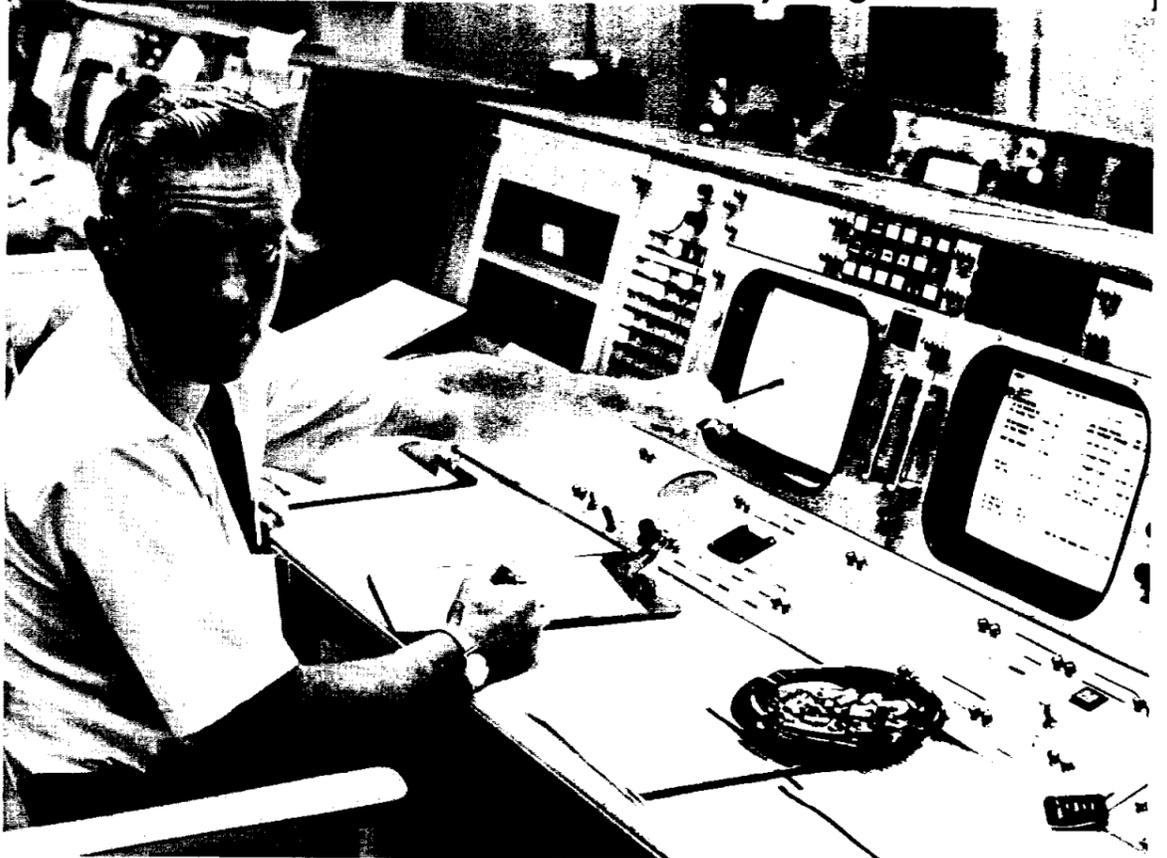
### A/S 203

(Continued from page 1)  
see a lot more turbulence and a lot more propellants splashing inside the tank just after insertion into orbit. I think that it does give us some confidence that we can restart the S-IVB—it gives us a great deal of confidence. One really needs to look at the data to tell for sure."

stand-up EVA and again post-flight for analysis, a comparison of the three sets of photographs will then enable the photolab to determine accurately the particular photographic processes through which they must go to process the film which comes back from the moon and to give better color fidelity on some of our later earth orbital missions."

"The second EVA," said Collins, "begins about 48 hours after liftoff . . . It is primarily a day operation. After getting the sequence camera set up, I'll go back to the adapter section and plug into a nitrogen line which enables me to fire cold nitrogen gas through a hand-held maneuvering unit which I'll have. This

## 'Flight' Keeps Tabs on S-IVB's Hydrogen Tank



**REMOTE EXPERIMENT**—A/S 203 Flight Director John Hodge comments to an associate in Mission Control-Houston about the clarity with which onboard television images of the S-IVB liquid hydrogen tank interior were received in the Control Center.

## Thermochemical Test Area Tests Hardware in MSC's 'Back Yard'

A lot of testing is going on in MSC's "backyard."

The Apollo fuel cell, which produces electrical power for the Apollo spacecraft, recently completed a run of 1000 hours in a vacuum facility at MSC's Thermochemical Test Area.

The engineers of the Propulsion and Power Division also test small attitude control rockets and explosive disconnects for the lunar spacecraft. Since safety restrictions are necessary for these devices, the test area is isolated on 110 acres of land behind the main MSC building complex.

There are five major test stand areas in the facility. The Thermochemical Space Chamber is 15 feet in diameter and can subject all types of propulsion and power equipment to space vacuum conditions.

The Reaction Control System Test Facility has five cells. Two of these cells are used for the firing of engines with up to 1000 pounds thrust. In the other chambers, as many as eight engines can be fired at the same time in a vacuum, simulating attitude control maneuvers which the Apollo spacecraft is expected to make during its voyage to the moon.

MSC engineers are also planning to connect engine controls in the vacuum test chamber with a guidance computer and its inertial platform in the Guidance and Control Laboratory. This set-up will create a realistic evaluation as a computer feeds simulated errors to the guidance equipment which in turn will fire the engines in the proper sequence to correct the simulated errors.

The Pyrotechnics Test Facil-

ity personnel are already conducting tests on the small explosive devices which are used to separate parts of the spacecraft such as adapter and recovery sections. For the parachutes to open after reentry, explosives on recovery sections must work after being exposed to high vibrations, temperatures and vacuum. The facility has equipment which will test the explosives under all of these conditions.

The Fluid Components Test Facility has been designed to check the flow of liquid propellants and other fluids through spacecraft lines. Demineralized water, gaseous nitrogen tetroxide, nitrogen, and helium will be used in addition to actual propellants.

The facility also contains a laminar flow clean room. A constant stream of filtered air flows through the room and literally blows dust and dirt away from delicate equipment.

The Space Power Systems Test Facility provides for mission tests of fuel cells. The power sources can be run as long as 20 days in this facility under the same power load they would supply during a mission.

People who run the thermochemical test facility have diverse talents. In addition to the normal group of electrical, mechanical and aeronautical engineers, there are operators who run the computers and instrumentation, chemical engineers who analyze propellants, and technicians who can use a metal lathe or an oscilloscope. Calibration laboratory technicians insure the accuracy of instrumentation which will record the tests.

## Gemini X Preparations

(Continued from page 1)

is a unit similar to the one that Ed White used on Spacecraft IV. I'll have a limitless supply of propellant whereas Ed was limited to a very short duration.

"I'll proceed over to the Gemini VIII Agena and retrieve Experiment S-10 which, of course, has been in orbit now for several months. This is a micro-meteorite experiment. Following that, I'll push off again from the spacecraft and do an evaluation of the hand-held maneuvering unit to see what problems, if any, are encountered in using it as a stabilizing and as a maneuvering device. Following that, John will very kindly come over with the spacecraft and retrieve me; and having demonstrated

that capability, we'll proceed into an analysis of tether dynamics which will be nothing more than pushing off from the spacecraft a second time, proceeding out to near the end of our 50-foot tether and attempting to return to the spacecraft by pulling in on the tether alone without any help from the gun to see what difficulties might arise in returning to the spacecraft by pulling in on the end of a long rope."

Collins continued by describing how the spacecraft hatch would be depressurized a third time to permit jettisoning of the umbilical and other EVA gear to keep the cockpit from becoming too crowded.